WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(SUPPLEMENTARY SHEET)

International File No. PCT/EP2004/052848

Re Point III:

The claims contain several significant ambiguities and contradictions. Furthermore, the description contains contradictory information concerning the embodiments.
In general, there appear to be **two different embodiments**, namely the one according to **Figure 2** (one sensor transmits and all subsequently receive, no coding of the transmission signal necessary) and the one according to **Figure 3** (all sensors simultaneously transmit encoded signals and apparently receive simultaneously, i.e., in parallel).
In the description, these are mixed in that in one case sequential transmission is assumed (only one sensor per time interval: **page 4, lines 17 through 18, Figure 2**) and simultaneous transmission is assumed in the other (**page 4, line 30 et seq., Figure 3**).
However, it is not possible to have both (sequential and simultaneous transmission) simultaneously and thus the features of **Claim 6** (simultaneous) and **Claim 8** (parallel evaluation of self-echoes and cross echoes) contradict the object of **Claim 1** and **3 through 5** (time delay of the transmission and reception signals). Based on **page 6, lines 4 et seq.**, it can only be assumed that what may be meant is that the transmitters of the sensors in the second embodiment ('simultaneous transmission') are in fact simultaneously and constantly active; however, they only transmit encoded pulses temporally offset in relation to one another.
However, Claim 6 opposes this interpretation as it unambiguously refers to simultaneous transmission (as also on page 4, line 30 et seq.). The parallel evaluation of self-echo

and cross echo according to Claim 8 is also only possible with simultaneous transmission (because otherwise the particular echo signals could not be present at the sensor at the same time).

Based on the cited contradictions, the object of **Claims 6 and 8** (to the extent it relates to parallel evaluation) cannot be further evaluated because it is not implementable (Art. 5 PCT), is unclear, and is not supported by the description (Art. 6 PCT).

The search was directed to the object according to Claim 3 and the associated description (simultaneous transmission and reception of all sensors using a PN coding, the contradiction with Claim 1 being left without consideration or it being assumed that no sequential transmission as according to Claim 1 is present); **however, it indicates Claim 6 and 8 as a reference.**

Under point V it is nonetheless attempted to evaluate this object according to Figure 3.

Claim 1 is also so ambiguous that at most an evaluation based on (the improved, see Point VII) Figure 2 is possible:

From Claim 1 and the description, it is clear that in receive operation the sensors are separated by the time delay of the transmission signals. This is evident in particular from Figure 2 and page 4, lines 17 through 18 and page 6, line 4 et seq. and page 8, lines 26 through 29 (in this connection, it would have been more appropriate not to refer to 'the separation of sensors' but instead, for example, the differentiation of reception signals; however, this is difficult to correct in retrospect).

However, what is not clear in Claim 1 is how the simultaneously ('and') claimed time delay of the reception signals should be understood.

From Figure 2 and the associated description, it is only possible to infer that in each transmission time frame, e.g., from t_{s3} to t_{s4}, the echoes of a single transmission signal (S_3 in the example) are received simultaneously by all sensors (S_1-S_4) (page 6, lines 15 through 17). Thus, the question as to how and when a time delay of the reception signals is to take place remains completely unanswered. Moreover, an additional delay of the reception signals appears to make no sense. Accordingly, the object of Claim 1 contradicts the description (Art. 6 PCT).

Consequently, the search was directed to the object according to Figure 2 and the associated description; however, it indicates Claim 1 as a reference.

The evaluation of the object of Claim 1 attempted in Point V is also based on (corrected) Figure 2.

Re Point V:

1. **Documents/citations:**

D1: DE 197 44 185 A1 (ROBERT BOSCH GMBH, 70469 STUTTGART, DE) April 8, 1999 (04-08-1999)

D2: DE 40 23 538 A1 (ROBERT BOSCH GMBH, 7000 STUTTGART, DE) January 30, 1992 (01-30-1992)

D3: DE 198 56 974 A1 (ROBERT BOSCH GMBH) September 07, 2000 (09-07-2000)

D4: EP-A-1 013 518 (SIEMENS AKTIENGESELLSCHAFT) June 28, 2000 (06-28-2000)

D5: DE 100 49 906 A1 (ROBERT BOSCH GMBH) April 11, 2002 (04-11-2002)

D6: WO 03/081278 A (ROBERT BOSCH GMBH; KLINNERT, ROLAND; ZOTT, CHRISTIAN) October 2, 2003 (10-02-2003)

D7: DE 198 02 724 A1 (ROBERT BOSCH GMBH, 70469 STUTTGART, DE) July 29, 1999 (07-29-1999)

D8: DE 101 38 001 A1 (ROBERT BOSCH GMBH) February 20, 2003 (02-20-2003)

2. **Novelty / inventive step:**

The present invention does not meet the requirements of Article 33(1) PCT because the subject matter of Claims 1 through 8 is not novel and does not contain an inventive step (Art. 33(3) PCT) as defined by Article 33(2) PCT, to the extent this subject matter can be evaluated at all (see above).

The reasons for this are as follows:

2.1 Each of documents **D1** through **D4** (see passages cited in the search report) describes

- a system having two or more sensors,
- each sensor having a transmitter and a receiver for signals,
- one sensor being able to receive a cross echo signal of another sensor,
- in receive operation, the sensors are temporally separated from one another by the time delay of the transmission and reception signals,

and thus all features of the single independent **Claim 1.**

2.2 Furthermore, each of documents **D1** through **D4** (see passages cited in the search report) describes

- a radar system, an optical system, or an ultrasound system having two or more communicating sensors

and thus all features of dependent **Claim 2.**

2.3 Furthermore, each of documents **D1** through **D4** (see passages cited in the search report) describes

- pulsed ultrasound sensors

and thus suggest alternatives for the pulsed radar sensors known to those skilled in the art in **Claim** 3 (see also **D5**, abstract).

2.4 Documents **D1** through **D4** do not explicitly describe a carrier signal modulated using PN codes (**Claim 4**). The resulting objective technical approach is to increase the unambiguity range or the range of the sensors (see also, for example, **D1**, column 3, line 68 et seq.). Those skilled in the art would accordingly find means to achieve this object consistent with Claim 4, e.g., in Document **D5** ([0009-0010]), stochastic coding), which deals with achieving this objective. Moreover, the PN coding is also known from D6 through D8 and is also included in the technical knowledge.

The object of Claim 4 is thus not inventive in the light of the obvious combined view of one of Documents D1 through D4 with one of Documents D5 through D8 or the general technical knowledge.

2.5 **Claim 5** states that only one distance range is evaluated or monitored within the maximum possible range (determined by the unambiguity range due, e.g., to the pulse repetition rate or undesirable multiple echoes). This is also implicitly contained in **D1**, column 3, line 68 et seq. and is further suggested in **D5**, [0010].

2.6 As stated above, the feature of **Claim 6** contradicts the subject matter of Claim 1. If it is assumed that (contrary to Claim 1) the sensors do not transmit sequentially but instead simultaneously (based on Figure 3 and the associated description), this is known from **D5** through **D8** (see cited passages in the search report). It is precisely for this reason that all these documents use

encoded pulses to be able to unambiguously assign their origin to a transmitter when they are received.

2.7 The same applies to **Claim 7**, which only refers to a time sequence of the reception of the echo signals, which merely represents an embodiment familiar to those skilled in the art.

2.8 To the degree the feature of **Claim 8** refers to the sequential evaluation of the echoes, it is described or suggested by **D1** through **D4**; to the degree it refers to the parallel evaluation (contradicts Claim 1), it is described or suggested by **D5** through **D8**.

Re Point VI:

European patent application **EP 04 104 108 .8** (filing date: 08/26/04, priority: DE 10343175, 9/18/03, the applicant also being BOSCH) represents an older European patent (not yet published), which may result in objections as to novelty to the subject matter of the claims in the regional phase before the EPO (Art. 54 (3,4), R. 23a EPC).

Re Point VII:

a) **Figure 2 is incorrect.** It neither provides dashes for the points in time t_{s1-4} on time axis t nor does it correctly indicate the reception intervals. According to page 8, line 26 et seq., the intervals $[t_a; t_b]$ and $t_{s3} + t_a$; $t_{s3} + t_b]$ should be referenced to the range 'sensor 1' or 'sensor 3,' because otherwise the reception would occur before or simultaneously with the transmission, which is nonsense.

b) The requirements of Rule 6.3 b) PCT have not been met because independent Claim 1 has not been drawn up in the proper two-part form with respect to the most proximate related art, e.g., according to D1.

c) The requirements according to Rule 5.1 (a) (ii) PCT have not been fulfilled because publications D1 through D8, which are part of the relevant related art, have not been acknowledged in the description.

Point VIII:

In addition to the ambiguities/contradictions cited with respect to Point III, the claims include the following ambiguities:

1. **Claim 3:**
   It is unclear what is meant by 'low' repetition frequency.

2. **Claim 7:**
   Claim 7 refers to one of the preceding claims. However, in the preceding claims, the term n (and accordingly n-1) radar sensors is only defined in Claim 6. This also applies to **Claim 8**. Furthermore, Claim 7 does not contain a definition of the meaning of c or $t_{s2...n}$ or r_a, etc. (no reference symbols but instead a part of a claimed formula).

3. In **Claim 6**, obviously optional features (pulse, PN-BPSK) are camouflaged as presumed reference symbols. This is also not permissible (Art. 6, R. 6.2 (b) PCT).

Note:

It is doubtful if the above defects can be completely eliminated at all without broadening the application beyond its original content.

Furthermore, because it is very brief and ambiguous, the application offers no substance that in the light of the related art known from the records would make it possible to identify an inventive step.

What is claimed is:

1. A system having two or more sensors, each sensor having a transmitter and a receiver for signals and one sensor being able to receive a cross echo signal of another sensor,
wherein each of the sensors of the system or of the respectively assigned receivers receives or analyzes self-echo signals or cross echo signals only for specific intervals, the intervals of the time delay of a reception signal in relation to a transmission signal of its own, a phase angle of the repetition frequency f_w of the transmission signal being selected differently for each sensor.

2. The system as recited in Claim 1,
wherein the system is a radar system having two or more communicating radar sensors (10), an optical system having two or more communicating optical sensors, or an ultrasound system having two or more communicating ultrasound sensors.

3. The radar system as recited in Claim 2,
wherein a carrier signal modulated by a PN code using ASK, PSK, BPSK, FSK or a combination of these modulation types is used for the transmission signals of the radar sensors (10).

4. The radar system as recited in Claim 3,
wherein each of the radar sensors (10) monitors a distance range $[r_a; r_b]$ to be monitored from the interval $[0m; R_{max}]$ where: $0m \leq r_a \leq r_b \leq R_{max}$.

5. The radar system as recited in Claim 3 or 4,
wherein n radar sensors (10) transmit simultaneously,

without interruption an appropriately modulated transmission signal (pulse, PN-BPSK).

6. The radar system as recited in one of the preceding claims,
wherein the first radar sensor receives the cross echoes of the n-1 additional communicating radar sensors (10) in the distance ranges $[c/2t_{s2...n})+r_a; c/(2t_{s2...n})+r_b]$.

7. The radar system as recited in one of the preceding claims,
wherein a self-echo signal and (n-1) cross echo signals are evaluated simultaneously and/or sequentially in a radar sensor (10), in particular when simultaneous evaluation of a plurality of receivers (15) is provided.